(19)日本国特許庁（ＪＰ）　(12)公開特許公報（Ａ）　(11)特許出願公開番号
特開2002－180162
（P2002－180162A）
(43)公開日　平成14年６月26日(2002.6.26)

(51)Int.Cl.⁷	識別記号	Ｆ Ｉ		テーマコード（参考）
Ｃ２２Ｃ　9/06		Ｃ２２Ｃ　9/06		３Ｊ０１１
1/08		1/08	Ｆ	４Ｋ０１８
1/10		1/10	Ｅ	４Ｋ０２０
Ｆ１６Ｃ　33/12		Ｆ１６Ｃ　33/12	Ａ	
// Ｂ２２Ｆ　3/11		Ｂ２２Ｆ　3/11	Ｚ	

審査請求　未請求　請求項の数１　ＯＬ　（全　５　頁）　最終頁に続く

(21)出願番号　特願2000－383454(P2000－383454)

(22)出願日　平成12年12月18日(2000.12.18)

(71)出願人　000006264
三菱マテリアル株式会社
東京都千代田区大手町１丁目５番１号
(72)発明者　兼崎　昇
新潟県新潟市小金町３－１　三菱マテリアル株式会社新潟製作所内
(72)発明者　丸山　恒夫
新潟県新潟市小金町３－１　三菱マテリアル株式会社新潟製作所内
(74)代理人　100076679
弁理士　富田　和夫　（外１名）

最終頁に続く

(54)【発明の名称】　モータ式燃料ポンプの黒鉛分散型Ｃｕ基焼結合金製軸受

(57)【要約】
【課題】　液体燃料の高圧高速流通下ですぐれた耐摩耗性を発揮するモータ式燃料ポンプの軸受を提供する。
【解決手段】　モータ式燃料ポンプの軸受を、質量％で、Ｎｉ：２０～４０％、Ｐ：０．１～０．９％、Ｃ：１～８％、を含有し、残りがＣｕと不可避不純物からなる組成、並びに５～２５％の気孔率を有する黒鉛分散型Ｃｕ基焼結合金で構成する。

1

【特許請求の範囲】
【請求項1】　質量%で、
Ni：20～40%、
P　：0．1～0．9%、
C　：1～8%、
を含有し、残りがCuと不可避不純物からなる組成、並びに5～25%の気孔率を有する黒鉛分散型Cu基焼結合金で構成したことを特徴とする、液体燃料の高圧高速流通下ですぐれた耐摩耗性を発揮するモータ式燃料ポンプの黒鉛分散型Cu基焼結合金製軸受。
【発明の詳細な説明】
【0001】
【発明の属する技術分野】この発明は、特に小型化され、かつ高駆動操業されるモータ式燃料ポンプに適用した場合にすぐれた耐摩耗性を発揮する黒鉛分散型Cu基焼結合金製軸受に関するものである。
【0002】
【従来の技術】従来、一般に燃料としてガソリンや軽油などの液体燃料を用いるエンジンにはモータ式燃料ポンプが備えられており、例えばガソリンエンジン用モータ式燃料ポンプとして図1に概略横断面図で示される構造のものが知られている。すなわち、図示される通り上記モータ式燃料ポンプは、ケーシング内において、モータの両端部に固設した回転軸が軸受に支持され、前記回転軸の一方端部にはインペラが挿入され、かつ前記インペラ、モータ（アーマチュア）の外周面、および軸受と回転軸との間の図示しない隙間にそって狭い間隙のガソリン流通路が形成された構造を有し、前記モータの回転でインペラが回転し、このインペラの回転でガソリンがケーシング内に取り込まれ、取り込まれたガソリンはインペラ、モータの外周面、および軸受と回転軸との間の図示しない隙間にそって形成された前記ガソリン流通路を通って送り出され、別設のガソリンエンジンに送り込まれるように作動するものである。なお、図1では両軸受の外周部を微量の燃料が通過し、インペラで昇圧されたガソリンは図示しないケーシングの燃料通路を通してアーマチュア外周面のところまで到達する。また、上記のモータ式燃料ポンプの構造部材である上記軸受として各種のCu基焼結合金が用いられている。
【0003】
【発明が解決しようとする課題】一方、近年の例えば自動車などのエンジンの軽量化、並びに高性能化はめざましく、これに伴って、これに用いられる燃料ポンプにも小型化が強く求められているが、上記の構造のモータ式燃料ポンプの場合、吐出性能を確保しつつこれを小型化するには、高駆動すなわち回転数を高くすることが必要であり、そうすると、燃料ポンプ内に取り込まれたガソリンなどの液体燃料は一段と狭くなった間隙の流通路を高圧で、かつ速い流速で通り抜けることになり、このような条件下では特にモータ式燃料ポンプの構造部材である軸受には一段の高強度と耐摩耗性が要求されることになるが、上記の構造のモータ式燃料ポンプに用いられているCu基焼結合金製軸受においては、いずれも十分な強度および耐摩耗性を具備するものでないため、摩耗進行が速く、さらにこの摩耗進行は前記液体燃料が硫黄やその化合物などを不純物として含有する場合には、一層促進されるようになり、この結果比較的短時間で使用寿命に至るのが現状である。

2

【0004】
【課題を解決するための手段】そこで、本発明者らは、上述のような観点から、小型化されて、高駆動操業されるモータ式燃料ポンプに用いるのに適した軸受を開発すべく研究を行った結果、モータ式燃料ポンプの軸受を、質量%（以下、%は質量%を示す）で、Ni：20～40%、P　：0．1～0．9%、C　：1～8%、を含有し、残りがCuと不可避不純物からなる組成、並びに5～25%の気孔率を有する黒鉛分散型Cu基焼結合金で構成すると、液体燃料の高圧高速流を生起せしめるモータの高速回転により軸受が受ける摩擦抵抗が、軸受内に存在する気孔を介して軸受外周面から軸受内周面に供給される液体燃料によって形成される流体潤滑膜の作用で緩和され、一方前記気孔を形成した分だけ耐摩耗性が低下するようになるが、この耐摩耗性の低下はCu－Ni系合金の固溶体相からなる素地に分散分布した硬質のCu－P化合物と同じく素地に分散分布した潤滑性の高い遊離黒鉛によって補われることから、この結果の黒鉛分散型Cu基焼結合金製軸受は、これの素地を形成するCu－Ni系合金のもつすぐれた強度および耐食性と相俟って、液体燃料の高圧高速流に曝された環境下ですぐれた耐摩耗性を発揮するようになり、また、この黒鉛分散型Cu基焼結合金製軸受は硫黄やその化合物などを不純物として含有する液体燃料に対してもすぐれた耐食性を示す、という研究結果を得たのである。
【0005】この発明は、上記の研究結果に基づいてなされたものであって、Ni：20～40%、P　：0．1～0．9%、C　：1～8%、を含有し、残りがCuと不可避不純物からなる組成、並びに5～25%の気孔率を有する黒鉛分散型Cu基焼結合金で構成してなる、液体燃料の高圧高速流通下ですぐれた耐摩耗性を発揮するモータ式燃料ポンプの黒鉛分散型Cu基焼結合金製軸受に特徴を有するものである。
【0006】つぎに、この発明の軸受において、これを構成する黒鉛分散型Cu基焼結合金の成分組成および気孔率を上記の通りに限定した理由を説明する。
（1）成分組成
（a）Ni
Ni成分には、上記の通りCuに固溶して、Cu－Ni系合金の固溶体相からなる素地を形成し、軸受の強度および耐食性を向上させる作用があるが、その含有量が20%未満では、所望の高強度および高耐食性を確保する

ことができず、一方がその含有量が４０％を越えると強度が低下するようになることから、その含有量をＮｉ：２０～４０％、望ましくは２１～３０％と定めた。

【０００７】（ｂ）Ｐ

Ｐ成分には、焼結性を向上させて軸受強度の向上に寄与すると共に、素地に分散分布する硬質のＣｕ－Ｐ合金を形成して耐摩耗性を向上させる作用があるが、その含有量が０．１％未満では前記作用に所望の向上効果が得られず、一方その含有量が０．９％を越えると強度に低下傾向が現われるようになり、所望の高強度を安定的に確保するのが難しくなることから、その含有量を０．１～０．９％、望ましくは０．３～０．６％と定めた。

【０００８】（ｃ）Ｃ

Ｃ成分は、主として素地に分散分布する遊離黒鉛として存在し、軸受にすぐれた潤滑性を付与し、もって軸受の耐摩耗性向上に寄与する作用があるが、その含有量が１％未満では前記作用に所望の向上効果が得られず、一方その含有量が８％を越えると強度が急激に低下するようになることから、その含有量を１～８％、望ましくは２～６％と定めた。

【０００９】（２）気孔率

Ｃｕ－Ｎｉ系合金の素地に分散する気孔には、上記の通り液体燃料の高圧高速流通下で軸受が受ける強い摩擦および高い面圧を緩和し、もって軸受の摩耗を著しく抑制する作用があるが、その気孔率が５％未満では、素地中に分布する気孔の割合が少なくなり過ぎて前記作用を十分満足に発揮することができず、一方その気孔率が２５％を越えると、軸受の強度が急激に低下するようになることから、その気孔率を５～２５％、望ましくは１０～２０％と定めた。

【００１０】

【発明の実施の態様】この発明の黒鉛分散型Ｃｕ基焼結合金製軸受を実施例により具体的に説明する。原料粉末として、いずれも水アトマイズ法により形成され、かついずれも４５μｍの平均粒径を有するが、Ｎｉ含有量の異なる各種のＣｕ－Ｎｉ合金粉末、同じく４５μｍの平均粒径を有する水アトマイズＣｕ－Ｐ合金（Ｐ：３３％含有）粉末、さらに７５μｍの平均粒径を有する黒鉛粉末を用意し、これら原料粉末を所定の配合組成に配合し，ボールミルで４０分間混合した後、１５０～３００ＭＰａの範囲内の所定の圧力で圧粉体にプレス成形し、この圧粉体をアンモニア分解ガス雰囲気中、７５０～９００℃の範囲内の所定の温度に４０分間保持の条件で焼結することにより、それぞれ表１に示される組成並びに気孔率を有する黒鉛分散型Ｃｕ基焼結合金で構成され、かついずれも外形：９ｍｍ×内径：５ｍｍ×高さ：６ｍｍの寸法をもった本発明焼結軸受１～２０をそれぞれ製造した。この結果得られた本発明焼結軸受１～２０の任意断面を光学顕微鏡（２００倍）を用いて観察したところ、いずれもＣｕ－Ｎｉ系合金の固溶体相からなる素地にＣｕ－Ｐ合金と遊離黒鉛が微細に分散分布し、かつ気孔も存在する組織を示した。また、比較の目的で、表１に示される通りの組成とする以外は同一の条件でＣｕ基焼結合金で構成された軸受（以下、比較焼結軸受という）１～８をそれぞれ調製した。なお、上記の比較焼結軸受１～８は、いずれも合金成分含有量および気孔率のうちのいずれかがこの発明の範囲から外れたＣｕ基焼結合金で構成されたものである。

【００１１】ついで、上記の本発明焼結軸受１～２０および比較焼結軸受１～８を外形寸法が長さ：１１０ｍｍ×直径：４０ｍｍの燃料ポンプに組み込み、この燃料ポンプをガソリンタンク内に設置し、

インペラの回転数：３０００（最小回転数）～１００００（最大回転数）ｒ．ｐ．ｍ．、

ガソリンの流量：４５リットル／時（最小流量）～１５０リットル／時（最大流量）、

軸受が高速回転軸より受ける圧力：最大３００ＫＰａ、

試験時間：２００時間、

の条件、すなわちガソリンが狭い間隙を高速で流通し、これを生起せしめるモータの高速回転軸によって軸受が高圧を受け、かつ速い流速のガソリンに曝される条件で実機試験を行い、試験後の軸受面における最大摩耗深さを測定した。この測定結果を同じく表１に示した。また、表１には強度を評価する目的で、それぞれの焼結軸受の圧壊強度を示した。

【００１２】

【表１】

5　　6

種別		成分組成（質量％）				気孔率（％）	圧壊強度（N/mm²）	最大摩耗深さ（μm）
		Ni	P	C	Cu＋不純物			
本発明焼結軸受	1	21.1	0.43	3.12	残	15.2	152	1.1
	2	23.4	0.46	3.03	残	14.7	158	1.2
	3	24.8	0.45	3.02	残	14.6	156	1.1
	4	28.5	0.45	2.87	残	15.2	150	1.3
	5	34.5	0.42	2.95	残	15.0	147	1.2
	6	39.4	0.41	2.85	残	14.9	142	1.3
	7	23.2	0.12	3.06	残	14.6	132	1.8
	8	23.7	0.32	2.96	残	15.1	140	1.4
	9	23.1	0.57	3.07	残	15.4	150	1.3
	10	22.8	0.73	3.10	残	15.8	146	1.4
	11	23.5	0.86	3.08	残	14.7	142	1.5
	12	22.5	0.44	1.06	残	15.3	156	2.8
	13	23.1	0.47	2.08	残	15.5	159	2.4
	14	22.9	0.43	4.06	残	14.9	146	1.0
	15	23.0	0.44	5.65	残	14.8	134	0.9
	16	22.4	0.41	7.68	残	15.0	123	0.7
	17	23.4	0.48	3.05	残	5.6	197	2.4
	18	23.6	0.43	3.11	残	10.8	165	2.1
	19	23.2	0.47	2.99	残	17.9	147	1.2
	20	23.3	0.47	2.96	残	23.1	126	1.0
比較焼結軸受	1	18.6※	0.46	3.03	残	15.2	98	1.6
	2	41.3※	0.42	3.13	残	15.3	94	0.8
	3	23.6	0.06※	3.04	残	14.7	76	1.2
	4	22.9	1.12※	2.97	残	15.6	85	2.4
	5	23.1	0.45	0.43※	残	15.4	187	13.0
	6	23.0	0.46	9.24※	残	14.8	68	1.8
	7	22.7	0.47	3.01	残	4.2※	170	12.3
	8	23.5	0.44	3.05	残	26.7※	78	1.8

（表中、※印は本発明範囲外を示す）

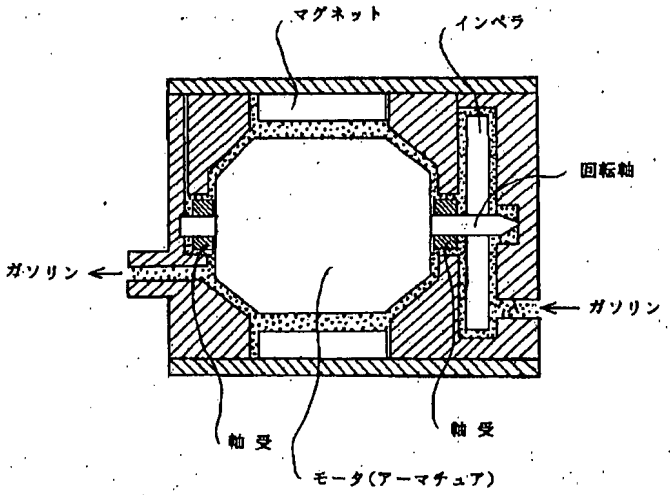
【0013】

【発明の効果】表１に示される結果から、黒鉛分散型Ｃｕ基焼結合金で構成された本発明焼結軸受１～２０は、いずれも高強度を有し、かつＣｕ－Ｎｉ系合金の固溶体相のもつすぐれた耐食性、並びにこれの素地に分散分布する気孔および硬質のＣｕ－Ｐ合金、さらに高い潤滑性を有する遊離黒鉛の作用で、特にモータ式燃料ポンプの軸受として用いた場合、ガソリンの高圧高速流通下で、一段とすぐれた耐摩耗性を発揮するのに対して、比較焼結軸受１～８に見られる通り、これを構成するＣｕ基焼結合金の成分含有量および気孔率のうちのいずれかがこの発明の範囲から外れると強度および耐摩耗性のうちの少なくともいずれかの低下は避けられないことが明らか＊である。上述のように、この発明の黒鉛分散型Ｃｕ基焼結合金製軸受は、通常の液体燃料を用いるエンジンのモータ式燃料ポンプ用としては勿論のこと、特にモータ式燃料ポンプの小型化および高駆動化に伴って回転軸から高面圧を受け、かつ液体燃料の高速流に曝される環境下で用いた場合でも、さらに液体燃料が不純物として硫黄やその化合物などを含有する場合にも、すぐれた耐摩耗性を発揮するものであるから、液体燃料を用いるエンジンの軽量化、並びに高性能化に十分満足に対応できるものである。

【図面の簡単な説明】

【図１】ガソリンエンジン用モータ式燃料ポンプの概略横断面図である。

【図1】



フロントページの続き

(51)Int.Cl.[7]	識別記号	FI	テーマコード(参考)
C22C 1/04		C22C 1/04	A

Fターム(参考) 3J011 BA02 DA01 KA02 LA01 SB03
SB15 SB19
4K018 AA04 AB07 KA03 KA22
4K020 AA24 AC04 BB29

APA

PATENT ABSTRACTS OF JAPAN

(11)Publication number : **2002-180162**

(43)Date of publication of application : **26.06.2002**

(51)Int.Cl. C22C 9/06

C22C 1/08

C22C 1/10

F16C 33/12

// B22F 3/11

C22C 1/04

(21)Application number : **2000-383454**

(22)Date of filing : **18.12.2000**

(71)Applicant : **MITSUBISHI MATERIALS CORP**

(72)Inventor : **KANEZAKI NOBORU**
MARUYAMA TSUNEO

(54) BEARING MADE OF GRAPHITE DISPERSED Cu BASED SINTERED ALLOY FOR MOTOR TYPE FUEL PUMP

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a bearing of a motor type fuel pump which exhibits excellent wear resistance under the high pressure-high speed passage of a liquid fuel.
SOLUTION: The bearing of a motor type fuel pump is consisting of a graphite dispersed Cu based sintered alloy having a composition containing, by mass, 20 to 40% Ni, 0.1 to 0.9% P and 1 to 8% C, and the balance Cu with inevitable impurities, and having a porosity of 5 to 25%.

CLAIMS

[Claim(s)]
[Claim 1] At mass %, they are nickel:20-40% and P. : 0.1 - 0.9%, C : Bearing made from

a graphite distributed Cu radical sintered alloy of the motor type fuel pump which demonstrates the abrasion resistance which is under high-pressure high-speed circulation of liquid fuel, and was excellent which contains 1 - 8% and is characterized by constituting from a graphite distributed Cu radical sintered alloy which has 5 - 25% of porosity in the presentation which the remainder becomes from Cu and an unescapable impurity, and a list.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] Especially this invention relates to the bearing made from a graphite distributed Cu radical sintered alloy which demonstrates the abrasion resistance which was excellent when it was miniaturized and applied to the motor type fuel pump by which high drive operation is carried out.
[0002]
[Description of the Prior Art] The thing of the structure which the engine using liquid fuel, such as a gasoline and gas oil, as a fuel is generally conventionally equipped with the motor type fuel pump, for example, is shown in drawing 1 with an outline cross-sectional view as a motor type fuel pump for gasoline engines is known. As illustrated namely, the above-mentioned motor type fuel pump The revolving shaft fixed to the both ends of a motor in casing is supported by bearing. An impeller is inserted in the one side edge of said revolving shaft. And said impeller, It has the structure where there were along the clearance which is not illustrated between the peripheral face of a motor (armature) and bearing, and a revolving shaft, and the gasoline circulation way of a narrow gap was formed. An impeller rotates by rotation of said motor and a gasoline is incorporated in casing by rotation of this impeller. The incorporated gasoline is sent out through said gasoline circulation way met and formed in the clearance which is not illustrated between an impeller, the peripheral face of a motor and bearing, and a revolving shaft, and it operates so that it may be sent into the gasoline engine of separate installation. In addition, in drawing 1 , the gasoline by which the fuel of a minute amount passed the periphery section of both bearings, and the pressure up was carried out by the impeller reaches through the fuel path of casing which is not illustrated till the place of an armature peripheral face. Moreover, various kinds of Cu radical sintered alloys are used as the above-mentioned bearing which is the structural member of the above-mentioned motor type fuel pump.
[0003]
[Problem(s) to be Solved by the Invention] On the other hand, although high-performance-izing is remarkable in lightweight-izing of engines, such as recent years, for example, an automobile etc., and a list and the fuel pump used for this is also called on for the miniaturization in connection with this In order to miniaturize this in the case of the motor type fuel pump of the above-mentioned structure, securing discharging performance When it is required to make a high drive, i.e., a rotational frequency, high and it does so, liquid fuel, such as a gasoline incorporated in the fuel pump, is high pressures about the circulation way of the gap which became narrow much more. And although it will pass by the quick rate of flow and one step of high intensity and abrasion

resistance will be required of the bearing which is the structural member of a motor type fuel pump especially under such conditions In the bearing made from Cu radical sintered alloy used for the motor type fuel pump of the above-mentioned structure Since it is not that in which all possess sufficient reinforcement and abrasion resistance, wear advance is quick and the present condition is this wear advance coming to be further promoted, when said liquid fuel's contains sulfur, its compound, etc. as an impurity, and resulting in a use life comparatively as a result for a short time further.

[0004]

[Means for Solving the Problem] Then, the result of having inquired this invention persons developing the bearing suitable for being miniaturized and using for the motor type fuel pump by which high drive operation is carried out from the above viewpoints, About the bearing of a motor type fuel pump, it is mass % (% shows mass % hereafter). nickel: 20-40%, P : 0.1 - 0.9%, C : If constituted from a graphite distributed Cu radical sintered alloy which has 5 - 25% of porosity in the presentation which 1 - 8% is contained and the remainder becomes from Cu and an unescapable impurity, and a list The frictional resistance which bearing receives by high-speed rotation of the motor which makes the high-pressure high-speed style of liquid fuel occur Although abrasion resistance comes to fall, only the part which was eased in the operation of the fluid lubrication film formed with the liquid fuel supplied to bearing inner skin from a bearing peripheral face through the pore which exists in bearing, and formed said pore on the other hand From being compensated by the base which consists of a solid-solution phase of a Cu-nickel system alloy with the high isolation graphite of the lubricity which carried out distributed distribution at the base as well as the hard Cu-P compound which carried out distributed distribution, this wear-resistant fall The bearing made from a graphite distributed Cu radical sintered alloy of this result With the outstanding reinforcement and the corrosion resistance which the Cu-nickel system alloy which forms the base of this has, conjointly The research result that come to demonstrate the abrasion resistance which is under the environment put in the style of [of liquid fuel] the high-pressure high speed, and was excellent, and this bearing made from a graphite distributed Cu radical sintered alloy showed the corrosion resistance which was excellent also to the liquid fuel which contains sulfur, its compound, etc. as an impurity was obtained.

[0005] This invention is made based on the above-mentioned research result. nickel:20-40%, P : 0.1 - 0.9%, C : The presentation which 1 - 8% is contained and the remainder becomes from Cu and an unescapable impurity, It has the description in the bearing made from a graphite distributed Cu radical sintered alloy of the motor type fuel pump which demonstrates the abrasion resistance which is under high-pressure high-speed circulation of the liquid fuel which it comes to constitute from a graphite distributed Cu radical sintered alloy which has 5 - 25% of porosity, and was excellent in the list.

[0006] The reason which limited next the component presentation and porosity of a graphite distributed Cu radical sintered alloy which constitute this as above-mentioned in the bearing of this invention is explained.

(1) Although a component (presentation a) NiNi component has the operation which dissolves to Cu as above-mentioned, forms the base which consists of a solid-solution phase of a Cu-nickel system alloy, and raises the reinforcement of bearing, and corrosion resistance the content if the content cannot secure desired high intensity and high corrosion resistance at less than 20% but the content exceeds [one side] 40%, since

reinforcement will come to fall -- nickel: -- it was desirably determined as 21 - 30% 20 to 40%.

[0007] (b) Although PP component has the operation which forms in a base the hard Cu-P alloy which carries out distributed distribution, and raises abrasion resistance while raising a degree of sintering and contributing to improvement in bearing reinforcement The improvement effectiveness of a request [at less than 0.1%] of the content to said operation is not acquired. On the other hand, when the content exceeded 0.9%, a fall inclination came to appear in reinforcement, and since it became difficult to secure desired high intensity stably, the content was desirably determined as 0.3 - 0.6% 0.1 to 0.9%.

[0008] (c) Although CC component has the operation which mainly exists in a base as an isolation graphite which carries out distributed distribution, gives and has the lubricity excellent in bearing, and contributes to the wear-resistant improvement in bearing The improvement effectiveness of a request [at less than 1%] of the content to said operation was not acquired, but since reinforcement came to have fallen rapidly when the content exceeded 8% on the other hand, the content was desirably determined as 2 - 6% 1 to 8%.

[0009] (2) Although the pore distributed on the base of a porosity Cu-nickel system alloy has the operation which eases and has strong friction and the high planar pressure which bearing receives under high-pressure high-speed circulation of liquid fuel as above-mentioned, and controls wear of bearing remarkably If the rate of pore that the porosity is distributed in a base at less than 5% decreases too much, and said operation cannot be enough demonstrated to satisfaction but the porosity exceeds 25% on the other hand Since the reinforcement of bearing came to have fallen rapidly, the porosity was desirably determined as 10 - 20% 5 to 25%.

[0010]

[The mode of implementation of invention] An example explains concretely the bearing made from a graphite distributed Cu radical sintered alloy of this invention. Although each is formed by the water atomizing method and all have the mean particle diameter of 45 micrometers as raw material powder Various kinds of Cu-nickel alloy powder with which nickel contents differ, the water atomization Cu-P alloy (P:33% content) powder which similarly has the mean particle diameter of 45 micrometers, After preparing the graphite powder which has a 75 more-micrometer mean diameter, blending these raw material powder with a predetermined combination presentation and mixing for 40 minutes with a ball mill, By carrying out press forming to a green compact by the predetermined pressure of 150-300MPa within the limits, and sintering this green compact on condition that maintenance for 40 minutes to the predetermined temperature in an ammonolysis gas ambient atmosphere and within the limits of 750-900 degrees C this invention sintering bearing 1-20 in which it consisted of graphite distributed Cu radical sintered alloys which have porosity in the presentation list shown in Table 1, respectively, and all had an appearance:9mmx bore:5mmx height:6mm dimension was manufactured, respectively. When the arbitration cross section of this invention sintering bearing 1-20 obtained as a result was observed using the optical microscope (200 times), the organization where a Cu-P alloy and an isolation graphite carry out distributed distribution minutely, and pore also exists in the base in which all consist of a solid-solution phase of a Cu-nickel system alloy was shown. Moreover, the bearing (henceforth comparison sintering bearing) 1-8 which consisted of same conditions with Cu radical

sintered alloy was prepared, respectively except considering as a presentation as shown in Table 1 for the comparative purpose. In addition, the above-mentioned comparison sintering bearing 1-8 is constituted from a Cu radical sintered alloy from which either an alloy quantitative formula or the porosity separated from the range of this invention by each.

[0011] Subsequently, a dimension includes the above-mentioned this invention sintering bearing 1-20 and the above-mentioned comparison sintering bearing 1-8 in a die-length:110mmx diameter:40mm fuel pump. This fuel pump is installed in a gas tank. Number of rotations:3000(minimum rotational frequency) -10000(maximum engine speed) r.p.m. of an impeller, The flow rate of a gasoline : 45l. (minimum discharge)/o'clock - 150l. (maximum stream flow)/o'clock The pressure which bearing receives from a high-speed revolving shaft : A maximum of 300 KPa, test time:200 hours, The system trial was performed on the conditions which ******, i.e., a gasoline, circulates a narrow gap at high speed, and bearing receives high pressure with the high-speed revolving shaft of the motor which makes this occur, and are put to the gasoline of the quick rate of flow, and the maximum wear depth in the bearing surface after a trial was measured. Similarly this measurement result was shown in Table 1. Moreover, the collapse reinforcement of each sintering bearing was shown in Table 1 in order to evaluate reinforcement.

[0012]

[Table 1]

種別		成分組成（質量%）				気孔率（%）	圧壊強度（N/mm²）	最大摩耗深さ（μm）
		Ni	P	C	Cu＋不純物			
本発明焼結軸受	1	21.1	0.43	3.12	残	15.2	152	1.1
	2	23.4	0.46	3.03	残	14.7	158	1.2
	3	24.8	0.45	3.02	残	14.6	156	1.1
	4	28.5	0.45	2.87	残	15.2	150	1.3
	5	34.5	0.42	2.95	残	15.0	147	1.2
	6	39.4	0.41	2.85	残	14.9	142	1.3
	7	23.2	0.12	3.06	残	14.6	132	1.8
	8	23.7	0.32	2.96	残	15.1	140	1.4
	9	23.1	0.57	3.07	残	15.4	150	1.3
	10	22.8	0.73	3.10	残	15.8	146	1.4
	11	23.5	0.86	3.08	残	14.7	142	1.5
	12	22.6	0.44	1.06	残	15.3	156	2.8
	13	23.1	0.47	2.08	残	15.5	159	2.4
	14	22.9	0.43	4.06	残	14.9	146	1.0
	15	23.0	0.44	5.65	残	14.8	134	0.9
	16	22.4	0.41	7.68	残	15.0	123	0.7
	17	23.4	0.48	3.05	残	5.6	197	2.4
	18	23.6	0.43	3.11	残	10.8	165	2.1
	19	23.2	0.47	2.99	残	17.9	147	1.2
	20	23.3	0.47	2.96	残	23.1	126	1.0
比較焼結軸受	1	18.6※	0.46	3.03	残	15.2	98	1.6
	2	41.3※	0.42	3.13	残	15.3	94	0.8
	3	23.6	0.06※	3.04	残	14.7	76	1.2
	4	22.9	1.12※	2.97	残	15.6	85	2.4
	5	23.1	0.45	0.43※	残	15.4	187	13.0
	6	23.0	0.46	9.24※	残	14.8	68	1.8
	7	22.7	0.47	3.01	残	4.2※	170	12.3
	8	23.5	0.44	3.05	残	26.7※	78	1.8

（表中、※印は本発明範囲外を示す）

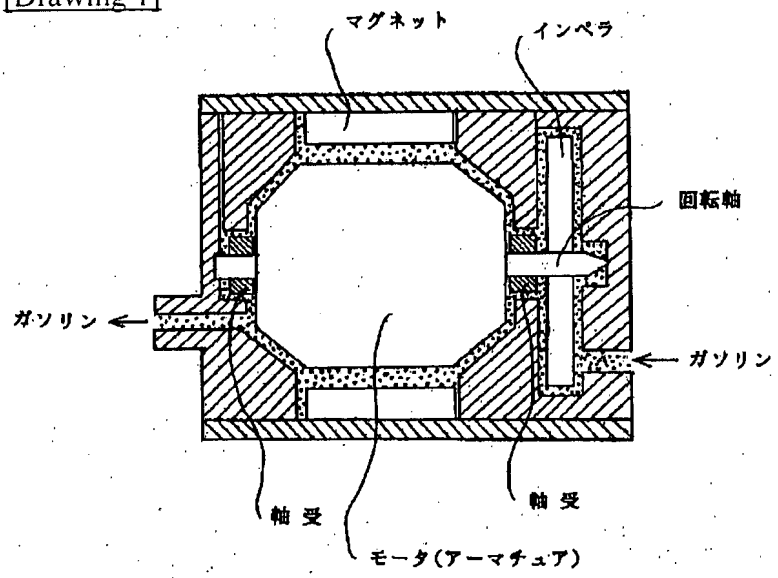
[0013]

[Effect of the Invention]' From the result shown in Table 1, this invention sintering bearing 1-20 which consisted of graphite distributed Cu radical sintered alloys On the base of this at the outstanding corrosion resistance which all have high intensity and the solid-solution phase of a Cu-nickel system alloy has, and a list in an operation of the pore which carries out distributed distribution and a hard Cu-P alloy, and the isolation graphite which has still higher lubricity When it uses as bearing of a motor type fuel pump especially, under high-pressure high-speed circulation of a gasoline As the comparison sintering bearing 1-8 seeing to demonstrating the abrasion resistance which was excellent much more, If either the quantitative formula of Cu radical sintered alloy which constitutes this or the porosity separate from the range of this invention, the thing of falls [at least / one of] reinforcement and of the abrasion resistance which is not avoided is

clear. As mentioned above, the bearing made from a graphite distributed Cu radical sintered alloy of this invention As an object for the motor type fuel pumps of the engine using the usual liquid fuel, of course High planar pressure is especially received from a revolving shaft with the miniaturization of a motor type fuel pump, and a raise in a drive. And also when it uses under the environment put in the style of [of liquid fuel] a high speed and liquid fuel contains sulfur, its compound, etc. as an impurity further Since the outstanding abrasion resistance is demonstrated, it can respond to high performance-ization enough in lightweight-izing of the engine using liquid fuel, and a list at satisfaction.

DRAWINGS

[Drawing 1]



It is the outline cross-sectional view of the motor type fuel pump for gasoline engines.